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ABSTRACT

Oxendine (1970) hypothesized that the arousal-performance relationship varies across tasks, such that gross motor activities will require high arousal for optimal performance while fine motor activities will be facilitated by low arousal, but adversely affected by high arousal. Although the effects of preparatory arousal on strength performance has been well investigated, no study has examined the effect of preparatory arousal on a fine motor skill. A motor skill accuracy task involving fine muscle coordination (putting a golf ball) was used to study the effects of two different cognitive interventions on sports competition anxiety and performance in 61 undergraduates, 19 of whom were highly anxious in competitive sporting situations. Subjects were randomly assigned to one of three experimental conditions: (1) a cognitive-behavioral stress reduction group; (2) a psyching-up arousal group; or (3) a control group. All subjects completed the putting task pre- and post-intervention. The results indicated that the cognitive-behavioral stress reduction group showed significantly greater reductions in anxiety during performance than did the other two groups. A nonsignificant trend emerged on performance scores such that only subjects in the psyching-up arousal group failed to improve their performance pre- to post-test. The findings provide some evidence that arousal-inducing interventions not appropriate to the target task can adversely affect performance. (NRB)

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Effects of Cognitive Interventions on Sports Anxiety and Performance

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Abstract

A motor skill accuracy task involoving fine muscle coordination, putting a golf ball, was utilized to study the effects of two different cognitive interventions on sports competition anxiety and performance. Sixty-one undergraduates participated in the study, 19 of whom were highly anxious in competitive sporting situations. Subjects were randomly assigned to one of three experimental conditions: (a) a cognitive-behavioral stress reduction group, (b) a "psyching-up" arousal group, and (c) a control group. All subjects completed a putting task pre- and post-intervention. The cognitive-behavioral stress reduction group showed significantly greater reductions in anxiety during performance than did the other two groups. A nonsignificant trend emerged on performance scores such that only subjects in the "psyching-up" arousal group failed to improve their performance pre- to posttest. The findings are discussed in the context of existing theories describing the relationship between arousal, cognitions, and performance.

Effects of Cognitive Interventions on Sports Anxiety and Performance

The past few years have seen a burgeoning interest in the relationship between anxiety and motor performance in the sport psychology literature. In the motor behavior literature anxiety has traditionally been defined as coextensive with arousal (Martens, 1971; Spence, 1971). Browne and Mahoney (1984) have suggested that most sport psychologists working in this area assume a curvilinear relationship between arousal and performance, such that performance will be optimal under a moderate level of arousal, and arousal levels that are either very low or very high will degrade performance. Oxendine (1970) has hypothesized that the arousal-performance relationship varies across tasks, such that gross motor activities involving speed, strength, and endurance (e.g., football) will require high arousal for optimal performance, while complex skills requiring fine muscle movements, steadiness, and concentration (e.g., putting a golf ball) will be facilitated by low arousal but adversely affected by high levels of arousal.

Researchers who have studied the ways in which athletes prepare mentally for performance have found that many athletes attempt to purposely elevate their level of arousal prior to performance by getting "emotionally charged up", or "psyched up", before competing (Fisher, 1976; Shelton & Mahoney, 1978; Weinberg, Gould, & Jackson, 1980; Weinberg, Gould, & Jackson, 1981). It has been suggested that such athletes are acting on an intuitive understanding of the Oxendine hypothesis, and that psyching-up may act as a cognitive stimulus which increases arousal (Weinberg et al., 1980). Some

recent studies have examined the effects on performance of attempting to experimentally manipulate arousal using mental preparation before performance. This mental preparation technique has come to be called preparatory arousal.

Gould, Weinberg, and Jackson (1980) looked at the effect of mental preparation techniques on the performance of a leg-kick task which measures muscular strength, power, and endurance. In the first of two experiments, five mental preparation strategies were employed with 30 subjects in a within-subjects design. These strategies were preparatory arousal, attentional focus, imagery, control rest, and a counting backwards cognitive distraction. Preparatory arousal and imagery strategies produced significantly better performance than the other three groups. In a second experiment using the same task, 60 subjects were employed in a between-subjects design. Only three groups were used: preparatory arousal, imagery, and control rest. Only the preparatory arousal group produced significantly higher performance than the control group. Measures of subjects' cognitive states supported the hypothesis that arousal was the major mediating variable accounting for increased performance in the preparatory arousal condition in the first experiment, but not in the second.

Wilkes and Summers (1984) studied the effectiveness of five mental preparation conditions on a leg kick task measuring muscular strength. Preparatory arousal and self-efficacy techniques produced significantly greater posttest strength performance than did a control group, while attention and imagery conditions did not differ from the control group. Cognitive state data indicated that strength change was found to correlate significanty only with the variables

of attention, arousal, and general activation, with arousal and attention being significantly intercorrelated. The only significant predictor of strength improvement was attention.

As a group, the above studies of mental preparation strategies indicate that having subjects engage in preparatory arousal prior to strength performance is likely to result in increased strength performance. These studies, however, are limited by inadequate checks on the independent variables and by incomplete assessment of the possible mediating links between cognitive techniques and motor performance. Having investigated only strength tasks, they also leave unaddressed the issue of what effect cognitive manipulations of arousal might have on fine motor skills.

Further information concerning the relationship between cognitions, arousal, and performance is available from the moderate amount of research which exists on the effects of anxiety or arousal on sporting performance during competition. Weinberg and Genuchi (1980) studied 10 low anxious, 10 moderately anxious, and 10 highly anxious collegiate golfers in a tournament field of 63. Trait competitive anxiety was measured prior to competition, and state anxiety was measured on each day of the tournamnet. Subjects in the low competitive trait anxiety group displayed significantly lower state anxiety scores and better performance than moderate or high anxious subjects, and all subects were more anxious early in the tourrament than they were late in the tournament.

Sonstroem and Bernardo (1982) studied 30 female varsity basketball starters whom they trichotomized on the basis of their responses on a measure of competitive trait anxiety. Low, moderate,

and high arousal levels were defined as an athlete's lowest, median, and highest pregame state anxiety values across three games of a basketball tournament. Competitive trait anxiety predicted state anxiety extremely well, but failed to achieve a significant relationship with performance. High state anxiety scores were associated with the poorest performance in all three trait groups, but this effect was particularly pronounced in high competitive trait anxiety subjects.

Cook et al. (1983) followed 103 male amateur golfers during three days of a prestigious collegiate golf tournament. Three levels of ability were defined: low, middle, and high. The findings from this study indicated that state anxiety was significantly correlated with ability, such that high ability golfers had the lowest anxiety. Golfers who played to, or better, than their ability on the first day were more anxious on later days than golfers who failed to play to their ability on the first day. On Day 3, low anxiety enhanced the performance of high ability golfers but detracted from the performance of low ability golfers.

Other studies relevant to the cognitions-arousal-performance relationship are those that have sought to examine the effects on athletic performance of cognitive-behavioral techniques designed to reduce stress and anxiety. Although a number of case studies suggest that such cognitive-behavioral techniques benefit performance (Meyers & Schleser, 1980; Silva, 1982; Suinn, 1972), the findings from group outcome studies have been more equivocal (Bennett & Stothart, 1978; Decaria, 1977; DeWitt, 1980; Kirschenbaum & Bale, 1980; Weinberg, Seabourne & Jackson, 1981, 1982).

No study to date has investigated the relationship between cognitions, arousal, and performance by employing cognitive strategies designed to influence arousal in both directions. Although the effects of preparatory arousal on strength performance have been well investigated, no study has examined the effect of preparatory arousal on a fine motor skill. The present study sought to test that portion of the Oxendine hypothesis that predicts the degradation of fine muscle coordination by arousal. In order to do this, subjects highly anxious in sports situations were contrasted with normal subjects on a motor skill accuracy task involving fine muscle coordination, putting a golf ball. Sports anxiety was crossed with three levels of intervention designed to manipulate arousal. The first of these was a cognitive-behavioral intervention designed to reduce the stress of sports performance. The second intervention was a psyching-up exercise designed to elevate arousal. This exercise was a more complex intervention than has been used in previous studies of preparatory arousal. The third condition was a control designed to have no effect on arousal. Anxiety and self-efficacy, possible mediators between cognitive interventions and motor performance, were repeatedly assessed.

Method

Subjects

Subjects were 61 college undergraduates, 47 male and 14 female, participating in the study for course credit. Subjects were selected as follows: The Sports Competitive Anxiety Test (SCAT, Martens, 1977), a measure of trait anxiety, was administered to 500 subjects in an undergraduate subject pool. Highly anxious subjects (scoring

at the 75th percentile or higher) were then contacted to participate in this study. Fifteen subjects were recruited in this way, and were randomly assigned to treatment conditions. For comparison purposes, another 46 subjects were recruited from the subject pool and were administered the SCAT upon arrival at the laboratory. Four of these subjects exceeded the 75th percentile and were added to the highly anxious group. The remaining subjects were divided into two equally-sized groups on the basis of their SCAT scores (a median split), and within these anxiety groups were randomly assigned to treatment conditions. Thus the final design included three levels of trait sports anxiety: high, medium, and low.

Procedure

Each subject was asked to putt three golf balls at a target putting cup across a carpeted surface from a distance of 8.5 feet. They were informed that these putts were to familiarize them with the task. Next, subjects were asked to make ten trial putts from this distance. A subject's performance on these ten putts determined the final distance from which he or she would putt. Subjects who made seven or more of their putts from this distance were placed in the expert category and subsequently putted from a distance of ten feet. Those who made between four and six of their putts constituted the intermediate group and thereafter putted from seven feet. Finally, those making three or fewer putts made up the low ability group and subsequently putted from a distance of five feet. This method of assignment had been found to reduce floor and ceiling effects in previous studies (Woolfolk, Murphy, Gottesfeld, & Aitken, in press; Woolfolk, Parrish & Murphy, 1985).

Following assignment to the appropiate putting distance, subjects were shown from where they were to putt subsequently, and were asked to fill out a self-efficacy measure asking them to estimate how many successful putts they would make from this distance. They also rated their level of tension at this time on a bipolar continuous scale (tense/relaxed), called the Tension Scale in this study (Anderson, 1970).

Each subject then attempted another 15 putts from his or her assigned distance, which served as the pre-test. Upon completing the pre-test, subjects were asked to complete the State Scale of the Spielberger Anxiety Inventory, (STAI: Spielberger, Gorsuch, & Lushene, 1970) with instructions to respond as they had felt while putting.

Subjects were then randomly assigned to one of the following three groups:

1) Cognitive-Behavioral Stress Reduction group. Subjects in this group listened to a 25-minute instructional audio tape via headphones while the experimenter left the room. The tape instructed the subjects in cognitive-behavioral stress reduction techniques, including pre-performance success imagery, positive self-talk, cue-controlled relaxation via paced respiration, and suggestions for using performance feedback to evaluate and correct ongoing performance. Subjects were instructed to use these techniques during the upcoming posttest.

2) Psyching-Up group. Subjects in this group listened to a tape of the same length as the stress reduction tape and under the same conditions. The tape intersperses recordings of broadcasts of

very exciting incidents during sporting events (football, basketball, and soccer) involving subjects' university varsity athletic teams, with typical "pep talk"-like exhortations such as "never give up", "always do your best", etc..

3) Control group. Subjects in this group were asked to complete a questionnaire requiring them to list their sporting likes and dislikes and to explain their choices in a brief essay. Subjects were given 25 minutes to complete the questionnaire.

After listening to the tape or completing the questionnaire, subjects were informed that there was a small monetary prize, ten dollars, for the person who improved the most at each ability level. This prize was offered in order to enhance the perception of competitiveness among subjects. They then completed the Self-Efficacy and Tension Scales again.

The posttest once again required subjects to attempt 15 putts from the assigned distance. Following the posttest, subjects were asked to complete the STAI again. They were also given a questionnaire asking them to describe how they thought the intervention (if any) had influenced performance. On two separate "yes" or "no" questions subjects were asked to indicate whether the intervention they had received had "helped" or "hurt" their performance. At the end of the experimental period, subjects were debriefed and the purposes of the study were explained.

Results

Anxiety

Scores on the Tension Scale and STAI were analysed by a 3 x 3 x 2 (treatment x anxiety level x trials) repeated measures ANOVA.

Table 1 shows the Tension Scale scores across trials for the three groups across the three levels of competitive trait anxiety, and

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Insert Tables 1 and 2 about here

Table 2 shows the corresponding STAI change scores. There was a significant main effect for trials on the Tension Scale, F (1,52) = 7.32, p <.01. Overall, subjects reported being less tense before the posttest than they did before the pretest. There was a significant trials by treatment interaction on both the Tension Scale and the STAI: Tension Scale, F (2,52) = 4.40, p <.05 (see Table 1); STAI, F (2,52) = 5.07, p <.01 (see Table 2). A Duncan's post-hoc test revealed that the stress reduction group displayed significantly greater decreases on both measures than both the psyching-up group and the control group. The stress reduction group displayed a significant reduction in reported tension from the pretest to the posttest, t (20) = 3.78, p <.005 (see Table 1), whereas the control group displayed a nonsignificant reduction and the psyching-up group showed a nonsignificant increase in tension on the Tension Scale from pretest to posttest. The stress reduction group also rated themselves as significantly less anxious at the posttest than at the pretest on the STAI, t (20) = 3.00, p <.01, while the measured anxiety of the other two groups showed a nonsignificant increase (see Table 2).

There was also a significant trials by anxiety level interaction on the Tension Scale, F (2,52) = 5.85, p <.01 (see Table 1). Low anxious subjects reported more tension before the posttest

than the pretest, while subjects in both the medium and high anxious groups reported less tension before the posttest than the pretest.

Competitive trait anxiety, as measured by the SCAT, was significantly correlated with pretest scores on both the Tension Scale, r (59) =.43, p <.001, and the STAI, r (59) =.29, p <.05, but not with posttest scores on these measures.

The only anxiety measure employed in the study which was significantly correlated with performance was state anxiety at posttest. This was correlated with improvement in putting from pre- to posttest, r (59) = -.27, p <.05, and indicates that the less anxious subjects were during the posttest, the more likely they were to improve their putting performance.

Putting performance

Table 3 shows putting performance scores for all three groups across trials across the three levels of competitive trait anxiety.

Insert Table 3 about here

Prior to the main analysis, putting improvement scores for males and females were subjected to a t-test to ascertain if there was a difference between the sexes in the extent of their improvement pre- to posttest. There was no significant difference between the sexes, p >.40, so data for males and females were grouped together in subsequent analyses. An analysis of variance was also conducted to determine if improvement scores differed among subjects who were placed in the expert, intermediate and low ability categories. There were no significant differences between groups, p >.40, so no level

of ability distinction was included in further analyses. A 3 x 3 x 2 (treatment x anxiety level x trials) repeated measures ANOVA showed a significant main effect for trials, F (1,52) = 4.08, p <.05. Overall, subjects improved their putting accuracy from pretest to posttest. Of the three treatment groups, subjects in the stress reduction group significantly improved their putting accuracy by an average of 1.3 putts out of 15, t (20) = 2.71, p <.05, and subjects in the control group significantly improved on average by 1.4 putts, t (18) = 2.37, p <.05, while subjects in the psyching-up group actually did worse on average by 0.1 putts. There were no other significant main or interaction effects on performance.

Self-efficacy

The correlation between subjects' predictions of performance and their actual performance was r(59) =.17, p >.15 at pretest and r(59) =.29, p <.05 at posttest. It seems likely, however, that subjects were using the strategy of predicting posttest performance from pretest performance, since their self-efficacy ratings at posttest and their pretest putting scores were significantly correlated, r(59) = .64, p <.001, and pre- and posttest performance scores were significantly correlated, r(59) =.39, p <.01. Using McNemar's (1969) formula, the correlation between self-efficacy at posttest and performance at posttest with the influence of pretest performance partialled out was found to be .06, t(58) =.47, and was not statistically significant.

There were no significant differences in self-efficacy between groups as a result of the experimental intervention, and at posttest the only significant relationship between self-efficacy and

performance was found in the stress reduction group, $r(19) = .45$, $p < .05$. Even for subjects in this group, however, previous performance was a better predictor of posttest performance than was self-efficacy, $r(19) = .59$.

Post-experimental questionnaire

In order to assess subjects' perceptions of the effects of the stress-reduction and psyching-up interventions, two separate chi-square analyses were conducted on the questions from the post-experimental questionnaire that asked subjects whether they thought the intervention had "helped" or "hurt" their performance. Responses were grouped into 2 x 2 contingency tables (see Table 4). The chi-square analysis for the question of whether subjects felt the intervention had helped performance was significant, $X^2(1, N = 42) = 5.56$, $p < .02$, indicating that significantly fewer subjects felt that the psyching-up strategy had been helpful. The analysis of the question as to whether subjects thought the intervention had hurt their performance was not significant, $X^2(1, N = 42) = 1.87$.

Insert Table 4 about here

Discussion

The finding that subjects in the stress reduction group reported significantly lower tension at posttest than at pretest, while subjects in the psyching-up group actually reported an increase in tension serves to confirm that the two active interventions in this study had their desired effect, and that the present study is a valid test of the Oxendine hypothesis. This

finding indicates that the use of fairly brief cognitive interventions can play an important role in the investigation of the arousal-performance relationship.

The finding that alone of all groups, the psyching-up group failed to show a performance gain from pre- to posttest, provides some support for the hypothesis advanced by Oxendine, that complex motor skills requiring fine muscle movements will be adversely affected by arousal-inducing strategies such as those employed in the psyching-up tape. Further support for this position comes from the comments of the subjects on the post-experimental questionnaire. Seven subjects in the psyching-up group stated on the questionnaire that they felt the tape was inappropiate for the putting task, and that they felt more like engaging in a "hard game of basketball or football" after listening to it. Moreover, significantly more subjects in the stress-reduction group thought that the intervention had helped their performance than did subjects in the psyching-up group. An appropiate extension of the present study would be to investigate whether the psyching-up intervention used in this study might have effects similar to those found for preparatory arousal interventions on the performance of subjects at tasks thought to require higher levels of arousal, such as strength or endurance tasks.

The finding that anxiety at posttest, measured by the STAI, was significantly negatively correlated with improvement is in accord with the findings of Sonstroem and Bernardo (1982), and Weinberg and Genuchi (1980). Neither state nor trait measures of sports performance anxiety, however, were good predictors of performance in

the present study.

It would seem that achieving a reduction in anxiety is not always a precursor to achieving performance gains. This study does not provide evidence to indicate that cognitive-behavioral interventions which lower anxiety automatically result in performance gains on a fine motor skill task.

A weaker relationship than expected emerged between self-efficacy and performance. Bandura (1977) has argued that performance accomplishments provide the most dependable source of efficacy information because they are based on personal mastery experiences. As predicted by self-efficacy theory exposure to the task improved the ability of subjects to predict their own performance. Previous performance, however, was a better predictor of performance at posttest than was self-efficacy, despite the fact that self-efficacy decisions putatively include other factors that might also influence performance, such as physiological arousal. Although there were no differences in levels of self-efficacy between groups as a result of treatment, the finding that the stress reduction group members were the best predictors of performance at posttest is provocative. This finding may indicate that the training that subjects were given in the stress reduction group enabled them to attend more accurately to the cues which govern performance, thus increasing the relationship between self-efficacy and performance. Even for these subjects, however, previous performance was a better predictor of posttest performance.

In summary, this study further supports the research which

indicates that cognitive-behavioral techniques are effective in reducing anxiety in competitive athletic situations, although such reductions do not automatically result in improved performance. Some evidence was provided that arousal-inducing interventions not appropiate to the target task can actually affect performance adversely. The Oxendine hypothesis thus received partial support in this study, in that the psyching-up group failed to show the performance gains of the other two groups on a task of fine muscle coordination. Future studies might also investigate the effects of cognitive interventions on the physiological response systems of subjects, using designs or tasks where such measurement would be less intrusive than would have been the case in the present study. The complexities of the relationship among cognitions, arousal, and performance should be systematically investigated in future.

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Table 1

Mean Tension Scale scores across trials for each treatment group across levels of competitive trait anxiety

	Competitive Trait Anxiety						
	Low		Medium		High		
Treatment Group	Pretest	Posttest	Pretest	Posttest	Pretest	Posttest	
Stress reduction	72.5	82.2	66.0	72.4	49.8	75.9	Mean
	14.6	12.4	25.1	30.8	15.0	13.1	S.D.
Psyching-up	80.6	63.6	61.3	71.4	57.7	66.8	Mean
	22.1	27.7	16.5	8.2	20.8	9.8	S.D.
Control	75.4	71.2	70.0	76.9	66.0	70.8	Mean
	13.4	27.2	22.3	18.8	15.7	16.9	S.D.

* Note:High scores equal low tension

Table 2

Mean STAI scores across trials for each treatment group across levels of competitive trait anxiety

	Competitive Trait Anxiety						
	Low		Medium		High		
Treatment Group	Pretest	Posttest	Pretest	Posttest	Pretest	Posttest	
Stress reduction	37.7	32.2	39.0	32.4	37.6	34.4	Mean
	7.3	5.5	7.3	10.2	6.1	10.2	S.D.
Psyching-up	31.9	37.0	35.4	32.7	40.8	41.5	Mean
	3.6	10.0	4.9	5.1	6.4	5.5	S.D
Control	27.6	34.6	32.4	33.4	34.4	37.6	Mean
	7.1	15.6	6.8	6.9	4.5	10.5	S.D.

Table 3

Putting scores across trials for each treatment group across levels of competitive trait anxiety

	Competitive Trait Anxiety						
	Low		Medium		High		
Treatment Group	Pretest	Posttest	Pretest	Posttest	Pretest	Posttest	
Stress reduction	4.5	6.7	5.7	6.7	6.3	7.1	Mean
	3.2	1.6	2.6	1.8	2.0	2.9	S.D.
Psyching-up	7.0	7.1	6.7	6.0	6.0	6.3	Mean
	2.8	3.5	4.9	4.1	3.1	2.7	S.D.
Control	7.0	8.0	6.8	8.6	6.6	7.6	Mean
	3.8	1.6	2.6	2.4	2.4	1.3	S.D.

Table 4

Number of subjects in stress reduction and psyching-up conditions endorsing each item of post-experimental questionnaire

Item	Treatment Group	Response	
		Yes	No
Image helped performance	Stress Reduction	20	1
	Psyching-up	14	7
Image hurt performance	Stress Reduction	4	17
	Psyching-up	8	13